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BERGER ASSOCIATES INC HARRISBURG PA
NATIONAL DAM INSPECTION PROGRAM, HIGHLANDS FARM DAM NDI NUMBER --ETC(U)
APR 81 DACW31-81-C-0013
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SUSQUEHANNA RIVER BASIN

HIGHLANDS FARM DAM

JOHN B. PETERS

NDI NO. PA-01099

DER NO. I-087

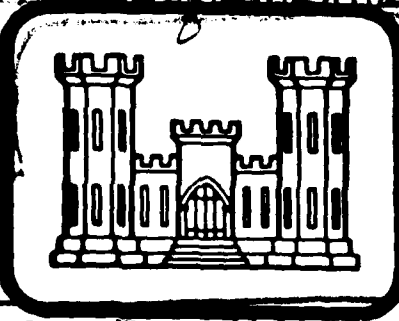
ADAMS COUNTY, PENNSYLVANIA

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM.

*Highlands Farm Dam, NDI number PA-01099
DER number I-087, Susquehanna River Basin.*

*Adams County,
Pennsylvania.
Phase I Inspection
Report.*



**DTIC
SELECTED
MAY 19 1981**

(15) DACW 31-81-C-0013

PREPARED FOR

DEPARTMENT OF THE ARMY

Baltimore District, Corps of Engineers

Baltimore, Maryland 21203

BY

Berger Associates

Harrisburg, Pennsylvania

17105

(11) APR 1981

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PREFACE

This report has been prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITIONS
AND RECOMMENDATIONS

Name of Dam: HIGHLANDS FARM DAM
State & State No.: PENNSYLVANIA, 1-087
County: ADAMS
Stream: TRIBUTARY TO LATIMORE CREEK
Date of Inspection: October 16, 1980

Based on the visual inspection, past performance and the available engineering data, the dam and its appurtenant structures appear to be in good condition.

In accordance with the Corps of Engineers' evaluation guidelines, the size classification of this dam is small and the hazard classification is significant. These classifications indicate that the Spillway Design Flood (SDF) should be in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). The recommended SDF for this structure is the 100 year flood. The spillway capacity is insufficient for passing the SDF peak inflow without overtopping the dam. The spillway, is considered to be inadequate, but not seriously inadequate.

The following recommendations are presented for immediate action by the owner:

1. That measures be taken to provide adequate spillway capacity.
2. That the spillway discharge channel be cleared of obstructions and trees over a length of at least 100 feet.
3. That the downstream slope and toe be cleared of weeds.
4. That the seepage on the slope be observed closely on a regular basis. If turbidity or an increase in flow is detected, immediate steps should be taken to correct this condition.
5. That provisions be made to provide for upstream closure of the outlet pipe in case of an emergency.
6. That a formal surveillance and downstream warning system be developed for use during periods of high or prolonged rainfall.

HIGHLANDS FARM DAM

NDI NO. PA-01099

DER NO. 1-087

JOHN B. PETERS

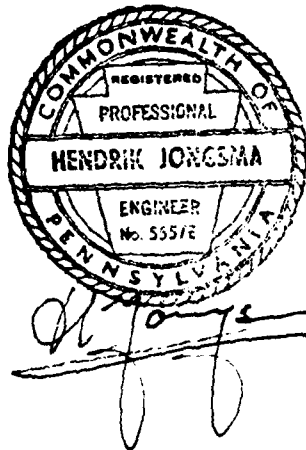
ADAMS COUNTY

7. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be developed for the annual inspection of the dam and its appurtenant structures.

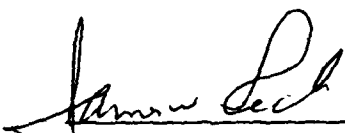
SUBMITTED BY:

BERGER ASSOCIATES, INC.
HARRISBURG, PENNSYLVANIA

DATE: April 3, 1981



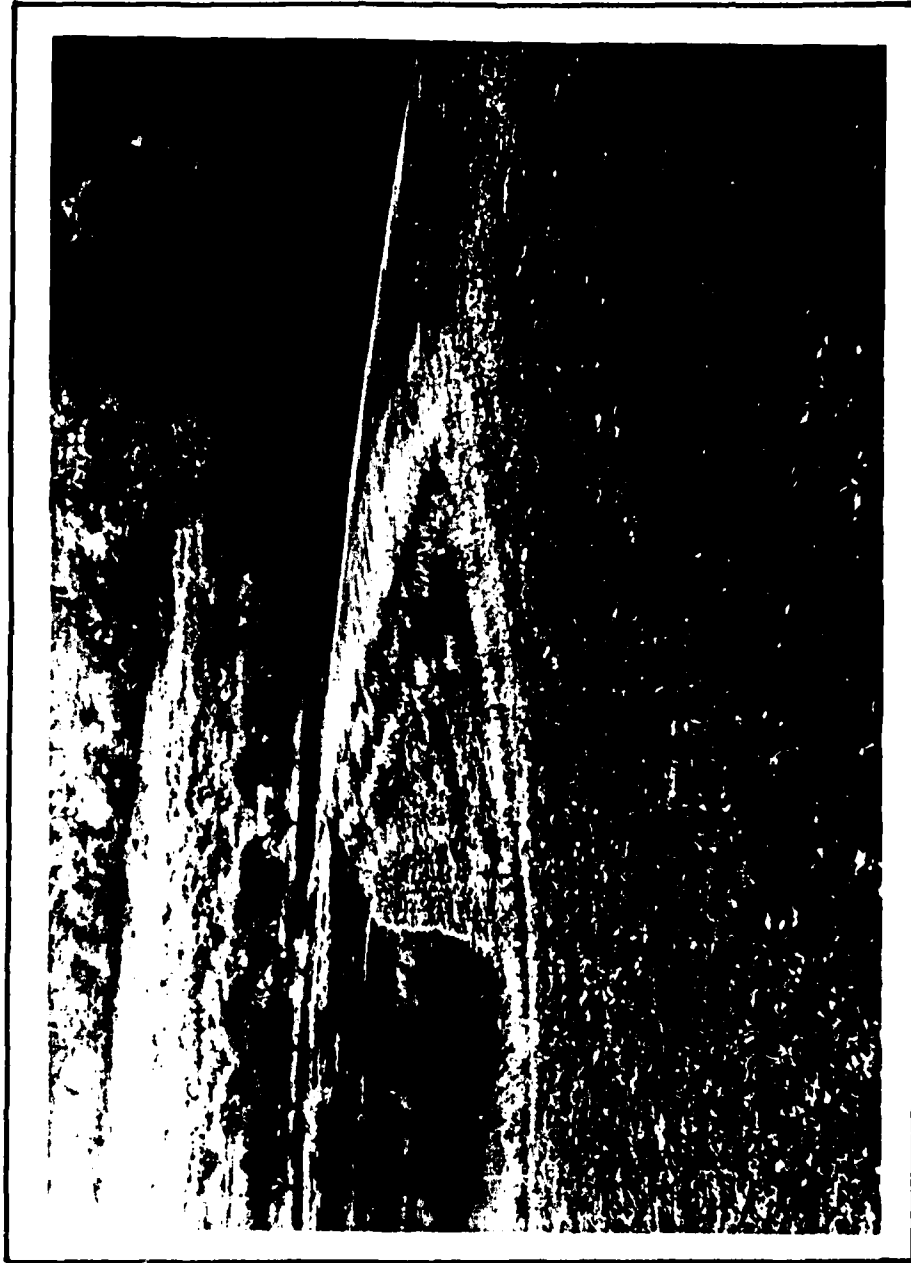
APPROVED BY:


JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

DATE:

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OVERVIEW

HIGHLANDS FARM DAM

Photograph No. 1

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

HIGHLANDS FARM DAM

NDI NO. PA-01099
DER NO. 1-087

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

A. Authority

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspections of dams throughout the United States.

B. Purpose

The purpose of this inspection is to determine if the dam constitutes a hazard to human life and property.

1.2 DESCRIPTION OF PROJECT

A. Description of Dam and Appurtenances

Note: Design data for this dam does not exist. It was estimated from the U.S.G.S. quadrangle sheet that normal pool elevation is 890. This elevation was used as the spillway weir elevation for this report.

Highlands Farm Dam is an earthfill structure with a maximum embankment height of about 28 feet. The reservoir is used for irrigation purposes and is located on an orchard farm adjacent to State Highway Rt. 94. The length of the embankment is about 350 feet.

The spillway is located in the left abutment and consists of a grass lined channel, discharging through an ill-defined, wooded channel beyond the downstream toe. A low area exists in the natural ground to the right of the right abutment (Plate A-II, Appendix A).

A 6-inch drawdown pipe is located near the center of the dam. This pipe has a downstream valve control. It is also used for irrigation purposes.

B. Location:

Latimore Township, Adams County
U.S.G.S. Quadrangle - Mt. Holly Springs, Pa.
Latitude 40°-02.9', Longitude 77°-09.0'
Appendix E, Plates I & II

- C. Size Classification: Small: Height - 28 feet
Storage - 48 acre-feet
- D. Hazard Classification: Significant (refer to Section 3.1.E.)
- E. Ownership: John B. Peters
R.D. #1
Gardners, PA 17324
- F. Purpose: Irrigation
- G. Design and Construction History

The dam was designed by the owner with assistance from the local Soil Conservation Service office. Drawings were not prepared for these facilities. The contractor was John Walters, Newville, Pennsylvania, and the year of construction was 1966.

H. Normal Operating Procedures

The 6-inch drawdown pipe is used regularly during the growing season for irrigation purposes. All inflow above the normal pool is discharged through the spillway.

1.3 PERTINENT DATA

A. Drainage Area (square miles)

From files:	N/A
Computed for this report:	0.24

B. Discharge at Dam Site (cubic feet per second)
See Appendix D for hydraulic calculations.

Maximum known flood (estimated from records of U.S.G.S. gage on nearby Conococheaque Creek)	34
Outlet works low pool outlet at pool Elev. 870	1.0
Outlet works at pool level Elev. 890 (spillway crest)	1.8
Spillway capacity at pool Elev. 891.4 (low point of dam)	55
Swale near right abutment at pool Elev. 891.4	23
Total discharge capacity	78

C. Elevation (feet above mean sea level)

Top of dam (design)	Unknown
Top of dam (low point as surveyed)	891.4
Spillway crest	890
Swale near right abutment	891.1
Upstream portal invert (estimated)	865
Downstream portal invert	861
Streambed at downstream toe of dam (estimate)	863

D. Reservoir (miles)

Length of normal pool	0.1
Length of maximum pool	0.1

E. Storage (acre-feet)

Spillway crest (Elev. 890)	41
Top of dam (Elev. 891.4) (low point)	48

F. Reservoir Surface (acres)

Top of dam (Elev. 891.4) (low point)	5.5
Spillway crest (Elev. 890)	5.1

G. Dam

Refer to Plates A-I and A-II in Appendix A for schematic plan and section.

Type: Earthfill.

Length: 350 feet.

Height: 28 feet.

Top Width: Design - Unknown, Survey - 12 feet.

Side Slopes:	<u>Design</u>	<u>Surveyed</u>
Upstream	Unknown	3.0H to 1V
Downstream	Unknown	3.0H to 1V

Zoning: Unknown.
Cutoff: Excavated trench on centerline.
Grouting: None.

H. Outlet Facilities

Type: 6" diameter cast iron pipe.
Location: Near center of dam.
Closure: Valve on downstream end.
Downstream
Invert Elev.: 861

I. Spillway

Type: Uncontrolled, sod lined, broad crested weir.
Width: 12 feet on bottom with side slopes of 5.7H:1V
on right and 8.8H:1V on left.
Crest
Elevation: 890
Location: Left abutment.

J. Regulating Outlet

See Section 1.3.H.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Engineering design data for Highlands Farm Dam does not exist. The owner stated that the general layout for the dam and its appurtenant structure was made by himself with assistance of the local office of the Soil Conservation Service. Drawings were not prepared for the facilities. The original design dam crest elevation is unknown.

2.2 CONSTRUCTION

The dam was constructed in 1966. The contractor was John Walters, Newville, Pennsylvania. Records of construction do not exist. The owner stated that borrow material was obtained from the reservoir area. A cutoff trench was excavated along the centerline of the dam and the embankment material was compacted by trucks.

2.3 OPERATION

Records of operation are not maintained by the owner. Maximum pool levels are not recorded.

2.4 EVALUATION

A. Availability

Engineering design and construction data do not exist.

B. Adequacy

Because of the lack of engineering data, the assessment of the dam is based on the visual inspection only.

C. Operating Records

Operating records have not been maintained.

D. Post Construction Changes

There are no indications of any post construction changes.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

A. General

The general appearance of Highlands Farm Dam is good. The embankment appears to be well maintained, except on the downstream slope from the outlet pipe to the right abutment. The downstream toe was wet in that area, but high grass and weeds prevented close observation. The spillway consists of a grassed swale in the left abutment.

The visual inspection check list and sketches of the general plan and profile of the dam, as surveyed during the inspection, are presented in Appendix A of this report. Photographs of the facilities taken during the inspection are reproduced in Appendix C.

Mr. John F. Peters represented the owner and accompanied the inspectors on the day of inspection.

B. Embankment

The dam is located in a rather flat area with a nearly level area beyond its left abutment (Photograph No. 2) and a gentle slope at its right abutment. The reservoir was 7.5 feet below its normal pool elevation at the time of inspection.

The exposed upstream slope was 3H to 1V with small stones at the normal pool elevation. The crest of the dam is 12 feet wide (Plate A-II) and covered with a well maintained grass mat. The horizontal alignment is straight, except at the right abutment where the embankment is curved and ties into higher ground. The surveyed profile is shown on Plate A-II, Appendix A. A low area exists beyond the embankment in the right abutment. The width of the crest and the condition of the downstream slope are adequate to use this area as an overflow section.

The downstream slope is 3H to 1V (Photograph No. 3). The left side is protected with a well maintained grass mat. The lower part of the downstream slope to the right of the outlet pipe is covered with high weeds. A wet condition of the soil was detected on the lower portion of the slope and at the toe. The high weeds, however, prevented close observation. There were no indications of accumulated seepage water.

C. Appurtenant Structures

The spillway, located in the left abutment, consists of a shallow, irregular, grassed swale. The control section is about 1.4 feet below the low point in the dam profile. The approach to the spillway is directly from the reservoir. The discharge channel is located to the

left of the embankment through a wooded and poorly defined swale. The uncontrolled spillway is the only outlet. Overflow is reported to occur regularly, especially in spring time.

A 6-inch drawdown pipe was installed near the bottom of the embankment. This pipe is open at the upstream end and has a valve at the downstream toe (Photograph No. 4). The pipe outlets about 20 feet downstream from the valve. Hoses can be connected to this pipe for irrigation purposes.

D. Reservoir Area

The reservoir has gentle slopes (Photograph No. 7) and is surrounded by cultivated land, mostly orchards. Because of the gentle slopes around the reservoir, sedimentation is not expected to be a serious problem.

E. Downstream Channel

The immediate downstream channel is a lightly wooded area which parallels State Route 94. The slopes are moderate and stable. The stream crosses Route 94 about 500 feet downstream from the dam. A local road crosses the stream 2,500 feet further downstream. Two houses are located near this crossing. A potential hazard to life exists downstream if the dam fails; however, possible loss of lives would be less than a few. The hazard category for the Highlands Farm Dam is therefore considered to be "Significant."

3.2 EVALUATION

The overall visual evaluation of the facilities indicates that the Highlands Farm Dam is in good condition. It is recommended that the downstream slope and the toe of the embankment on the right side be cleared of all brush and weeds to permit closer observation of the wet condition.

The downstream channel of the spillway should also be cleared of trees and brush over a length of about 100 feet.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Highlands Farm Dam was constructed for irrigation purposes. The need for irrigation of the orchards is generally in spring and summer. All inflow is stored until the pool level reaches the crest of the spillway. Operational procedures are limited to opening the valve on the 6-inch pipe when required for irrigation.

4.2 MAINTENANCE OF DAM

The crest and downstream slope of the embankment are mowed regularly, with the exception of the wet area to the right of the outlet pipe.

4.3 MAINTENANCE OF OPERATING FACILITIES

The only operating facility is the valve at the downstream toe. This valve is used regularly during the early growing season.

4.4 WARNING SYSTEM

There is no formally organized surveillance and downstream warning system in existence at the present time. The owner has his office and home across State Route 94 near the site of the dam.

4.5 EVALUATION

The operational procedures for Highlands Farm Dam are minimal. It is recommended that the maintenance of the dam include the mowing of the downstream slope on the right side.

A formal surveillance plan and downstream warning system should be developed for implementation during periods of heavy or prolonged precipitation.

SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

A. Design Data

Hydrologic and hydraulic analyses do not exist for Highlands Farm Dam.

B. Experience Data

There are no records of flood levels at Highlands Farm Dam. Based on records of the U.S.G.S. stream gage on Conococheague Creek at nearby Fayetteville, Pennsylvania, the maximum inflow to Highlands Farm Dam is estimated to be 34 cfs (June, 1972). This flood was passed without reported difficulties.

C. Visual Observations

No conditions were observed that would indicate that the appurtenant structures of the dam could not operate satisfactorily until the dam is overtopped, except that the discharge channel should be cleared of obstructions.

It was noted that a natural shallow swale is located near the right abutment. The high point of the swale is at elevation 891.1, 1.1 feet above the spillway crest. Flow through this area was included in the discharge capacity calculations (Appendix D) and is directed away from the embankment.

D. Overtopping Potential

Highlands Farm Dam has a total storage capacity of 48 acre-feet and an overall height of 28 feet above streambed. These dimensions indicate a size classification of "Small." The hazard classification is "Significant" (see Section 3.1.E.).

The recommended Spillway Design Flood (SDF) for a dam having the above classifications is in the range of the 100 year flood to one-half the Probable Maximum Flood (PMF). Because of the small size of the dam and the small downstream population, the recommended SDF is the 100 year flood. For this dam, the SDF peak inflow is 313 cfs (see Appendix D for HEC-1 inflow computations).

Comparison of the estimated SDF peak inflow of 313 cfs with the estimated spillway discharge capacity of 78 cfs indicates that a potential for overtopping of the Highlands Farm Dam exists.

An estimate of the storage effect of the reservoir and routing of the computed inflow hydrograph through the reservoir shows that this dam does not have the necessary storage capacity available to pass the SDF without overtopping the dam. The spillway-reservoir system passes the SDF with about 0.4 foot of overtopping, based on the present low point of the dam profile.

E. Spillway Adequacy

Calculations show that the spillway discharge capacity and reservoir storage capacity, based on the present low point in the dam profile, cannot pass the SDF without overtopping the dam (refer to Appendix D).

Since the total spillway discharge and reservoir storage capacity cannot pass the SDF, the spillway is considered inadequate; and because the hazard classification is significant, it is considered not to be seriously inadequate.

The hydrologic analysis for this investigation was based upon existing conditions of the watershed. The effects of future development were not considered.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

A. Visual Observations

1. Embankment

The visual inspection of Highlands Farm Dam detected a wet condition near and on the lower part of the embankment near the downstream toe, indicating that some seepage is occurring through the embankment. High and thick weed cover in this area prevented close observation of this condition. The embankment slopes are considered to be adequate for the height of dam under consideration, and appear to be stable.

2. Appurtenant Structures

The spillway is not well defined and its discharge channel is blocked by trees.

B. Design and Construction Data

Design and construction data for this dam do not exist.

C. Operating Records

Operating records for this dam have not been maintained by the owner. The owner stated that overflow of the spillway occurs regularly in the spring time.

D. Post Construction Changes

There are no indications that post construction changes were made at these facilities.

E. Seismic Stability

This dam is located in Seismic Zone 1, and it is considered that the static stability is sufficient to withstand minor earthquake-induced dynamic forces. No studies or calculations have been made to confirm this assumption.

SECTION 7 - ASSESSMENT AND RECOMMENDATIONS

7.1 DAM ASSESSMENT

A. Safety

The visual inspection indicates that Highlands Farm Dam is in good condition. The embankment appears to be stable. The apparent seepage occurring on the right half of the downstream slope should be observed on a regular basis.

The hydrologic and hydraulic computations indicate that the combination of storage capacity and the discharge of the spillway is insufficient to pass the 100 year flood, the recommended SDF, without overtopping. The spillway is considered to be inadequate, but not seriously inadequate.

B. Adequacy of Information

The visual inspection is considered to be sufficiently adequate for making a reasonable assessment of this dam.

C. Urgency

The recommendations presented below should be implemented immediately.

D. Additional Studies

Additional investigations are required to determine measures to provide an adequate spillway capacity.

7.2 RECOMMENDATIONS

In order to assure the continued satisfactory operation of this dam, the following recommendations are presented for implementation by the owner:

1. That measures be taken to provide adequate spillway capacity.
2. That the spillway discharge channel be cleared of obstructions and trees over a length of at least 100 feet.
3. That the downstream slope and toe be cleared of weeds.
4. That the seepage on the slope be observed closely on a regular basis. If turbidity or an increase in flow is detected, immediate steps should be taken to correct this condition.

5. That provisions be made to provide for upstream closure of the outlet pipe in case of an emergency.
6. That a formal surveillance and downstream warning system be developed for use during periods of high or prolonged rainfall.
7. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be developed for the annual inspection of the dam and its appurtenant structures.

APPENDIX A

CHECK LIST OF VISUAL INSPECTION REPORT

APPENDIX A

CHECK LIST

PHASE I - VISUAL INSPECTION REPORT

PA DER # 1-87

NDI NO. PA-01099

NAME OF DAM Highlands Farm Dam HAZARD CATEGORY Significant

TYPE OF DAM Earthfill

LOCATION Latimore TOWNSHIP Adams COUNTY, PENNSYLVANIA

INSPECTION DATE 10/16/80 WEATHER Sunny TEMPERATURE 60's

INSPECTORS: H. Jongsma (Recorder) OWNER'S REPRESENTATIVE(s):

R. Shireman

John F. Peters

A. Bartlett

J. Watson

(Estimated

NORMAL POOL ELEVATION: 890 U.S.G.S.) AT TIME OF INSPECTION: _____

BREAST ELEVATION: Unknown POOL ELEVATION: 882.4

SPILLWAY ELEVATION: 890.0 TAILWATER ELEVATION: _____

MAXIMUM RECORDED POOL ELEVATION: Unknown

GENERAL COMMENTS:

Pond used for farm irrigation and is in apparent good condition. Some seepage to the right of the outlet pipe.

VISUAL INSPECTION
EMBANKMENT

	OBSERVATIONS AND REMARKS
A. SURFACE CRACKS	None detected.
B. UNUSUAL MOVEMENT BEYOND TOE	None.
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	Slopes in good condition. No sloughing or erosion.
D. ALIGNMENT OF CREST: HORIZONTAL: VERTICAL:	Horizontal alignment good. Slight curve at right end. Vertical alignment - see Plate A-I.
E. RIPRAP FAILURES	No riprap. Small stones at normal pool elevation on upstream slope.
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	Right abutment in natural ground close to Route 94. Left abutment is right side of spillway.
G. SEEPAGE	No running water. A wet condition exists near the toe to the right of outlet pipe.
H. DRAINS	None detected.
J. GAGES & RECORDER	None.
K. COVER (GROWTH)	Upstream slope: Some stone and grass. Breast: Well kept grass. Downstream: Left half is mowed grass, excellent. Right half is covered with weeds.

VISUAL INSPECTION
OUTLET WORKS

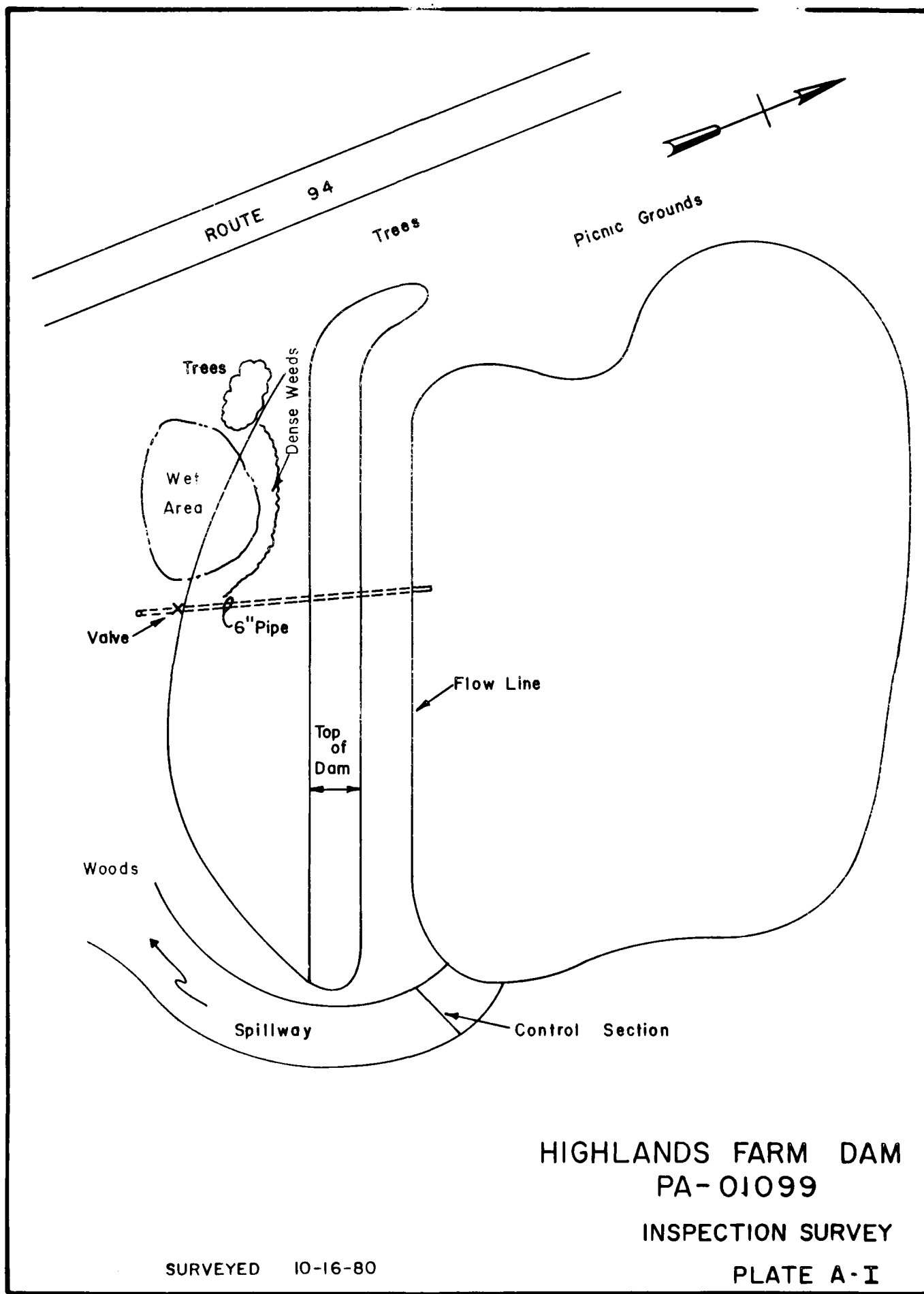
	OBSERVATIONS AND REMARKS
A. INTAKE STRUCTURE	6-inch pipe near upstream toe of embankment.
B. OUTLET STRUCTURE	Downstream valve on 6-inch pipe.
C. OUTLET CHANNEL	Wooded natural stream.
D. GATES	Valve at downstream end.
E. EMERGENCY GATE	Valve on downstream end of 6-inch pipe.
F. OPERATION & CONTROL	Operated regularly for irrigation.
G. BRIDGE (ACCESS)	None.

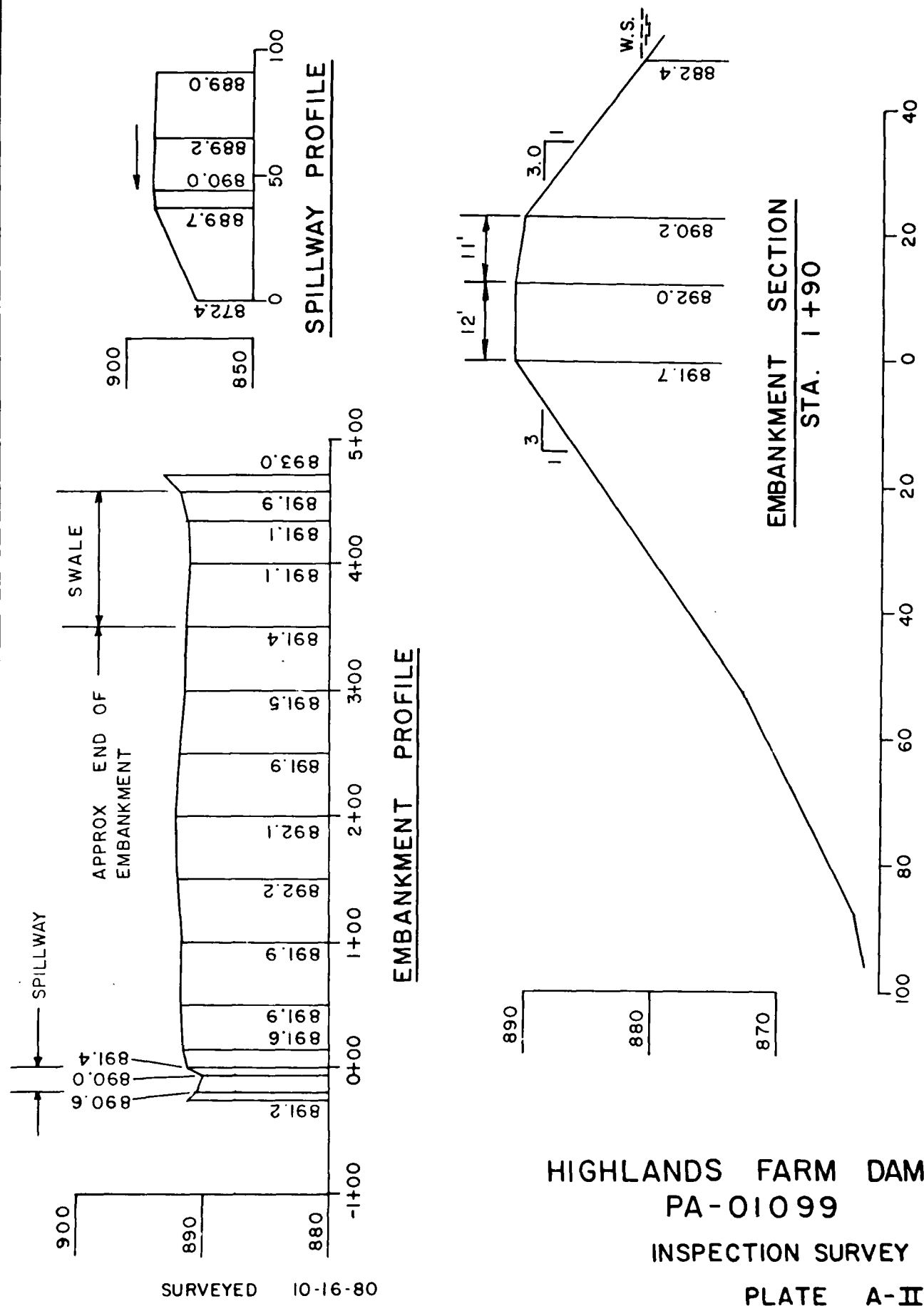
VISUAL INSPECTION
SPILLWAY

	OBSERVATIONS AND REMARKS
A. APPROACH CHANNEL	Unobstructed at the left end of reservoir.
B. WEIR: Crest Condition Cracks Deterioration Foundation Abutments	Grassed channel with some wheel tracks.
C. DISCHARGE CHANNEL: Lining Cracks Stilling Basin	Wooded ill defined channel.
D. BRIDGE & PIERS	None.
E. GATES & OPERATION EQUIPMENT	None.
F. CONTROL & HISTORY	This is the only outlet, and overflow occurs every spring.

VISUAL INSPECTION

	OBSERVATIONS AND REMARKS
<u>INSTRUMENTATION</u>	
Monumentation	None.
Observation Wells	None.
Weirs	None.
Piezometers	None.
Staff Gauge	None.
Other	None.
<u>RESERVOIR</u>	
Slopes	Moderate, stable.
Sedimentation	None reported.
Watershed Description	Some woodlands, mostly orchards.
<u>DOWNSTREAM CHANNEL</u>	
Condition	Wooded, some orchards.
Slopes	Moderate, stable.
Approximate Population	Six.
No. Homes	Route 94 and 2 homes at road crossing.





APPENDIX B
CHECK LIST OF ENGINEERING DATA

APPENDIX B

CHECK LIST
ENGINEERING DATA

PA DER # 1-087

NDI NO. PA- 01099

NAME OF DAM Highlands Farm Dam

ITEM	REMARKS
AS-BUILT DRAWINGS	None.
REGIONAL VICINITY MAP	U.S.G.S. Quadrangle - Mt. Holly Springs, Pa. See Plate II, Appendix E
CONSTRUCTION HISTORY	Constructed in 1966. Assistance by S.C.S. Designed by owner. Contractor - John Walters, Newville, Pa.
GENERAL PLAN OF DAM	Not available.
TYPICAL SECTIONS OF DAM	None.
OUTLETS: PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	None.

ENGINEERING DATA

ITEM	REMARKS
RAINFALL & RESERVOIR RECORDS	No records.
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS: HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None.
MATERIALS INVESTIGATIONS: BORING RECORDS LABORATORY FIELD	None.
POST CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Unknown. Presumably from reservoir area.

ENGINEERING DATA

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	No records.
POST CONSTRUCTION ENGINEERING STUDIES & REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM Description: Reports:	None reported.
MAINTENANCE & OPERATION RECORDS	No records.
SPILLWAY PLAN, SECTIONS AND DETAILS	No details.

ENGINEERING DATA

ITEM	REMARKS
OPERATING EQUIPMENT, PLANS & DETAILS	No details.
CONSTRUCTION RECORDS	None.
PREVIOUS INSPECTION REPORTS & DEFICIENCIES	None.
MISCELLANEOUS	

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Farmland (orchard)

ELEVATION:

TOP NORMAL POOL & STORAGE CAPACITY: Elev. 890 Acre-Feet 41TOP FLOOD CONTROL POOL & STORAGE CAPACITY: Elev. 891.4 Acre-Feet 48MAXIMUM DESIGN POOL: Elev. 891.4TOP DAM: Elev. 891.4

SPILLWAY:

a. Elevation 890b. Type Uncontrolled sod lined, broad crested weirc. Width 12' on bottomd. Length --e. Location Spillover Left abutmentf. Number and Type of Gates None

OUTLET WORKS:

a. Type 6" cast iron pipeb. Location Near center of damc. Entrance inverts 865±d. Exit inverts 861e. Emergency drawdown facilities 6" pipe

HYDROMETEOROLOGICAL GAGES:

a. Type None

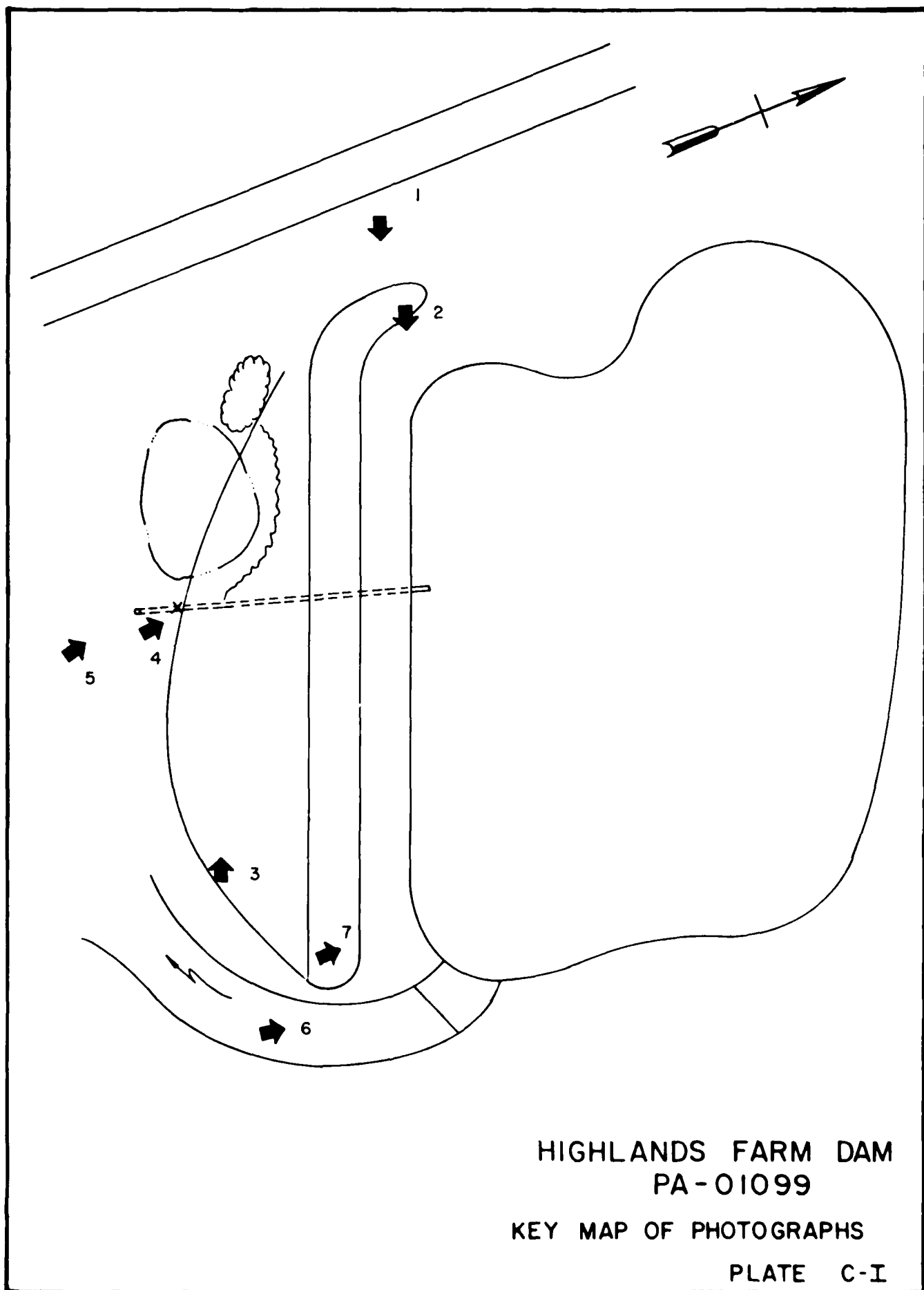
b. Location _____

c. Records _____

MAXIMUM NON-DAMAGING DISCHARGE: 78 cfs

APPENDIX C
PHOTOGRAPHS

APPENDIX C



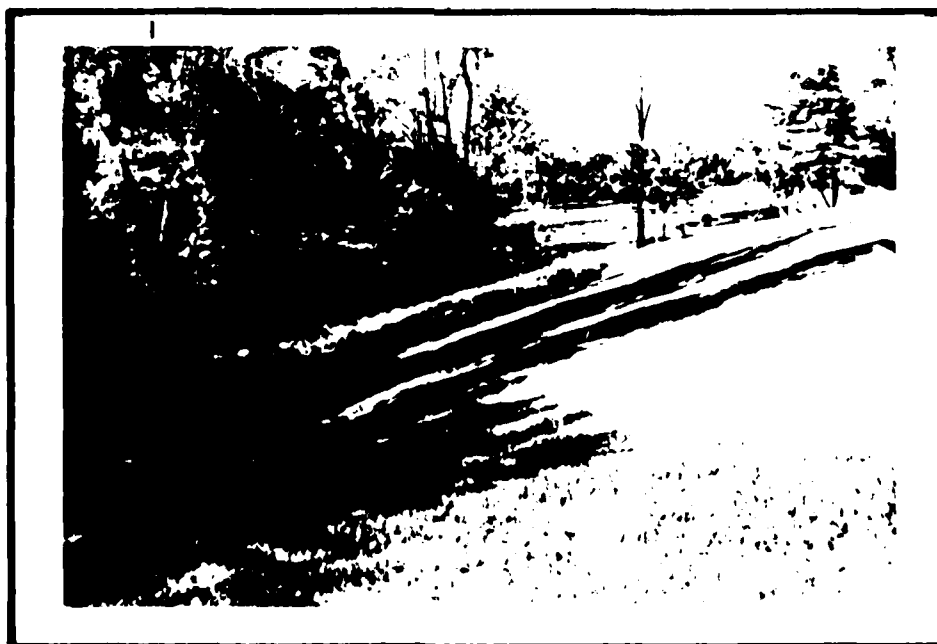
HIGHLANDS FARM DAM
PA-01099

KEY MAP OF PHOTOGRAPHS

PLATE C-I



UPSTREAM SLOPE FROM RIGHT ABUTMENT - NO. 2



DOWNSTREAM SLOPE - NO. 3
NOTE: GROWTH ON SLOPE IN RIGHT SECTION

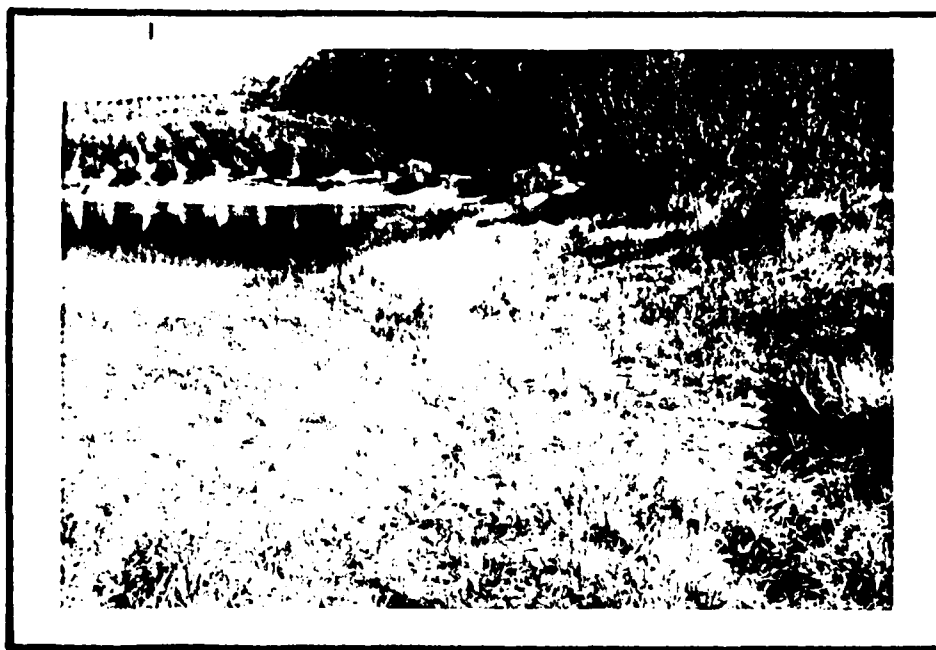


VALVE ON OUTLET PIPE AT DOWNSTREAM TOE - NO. 4

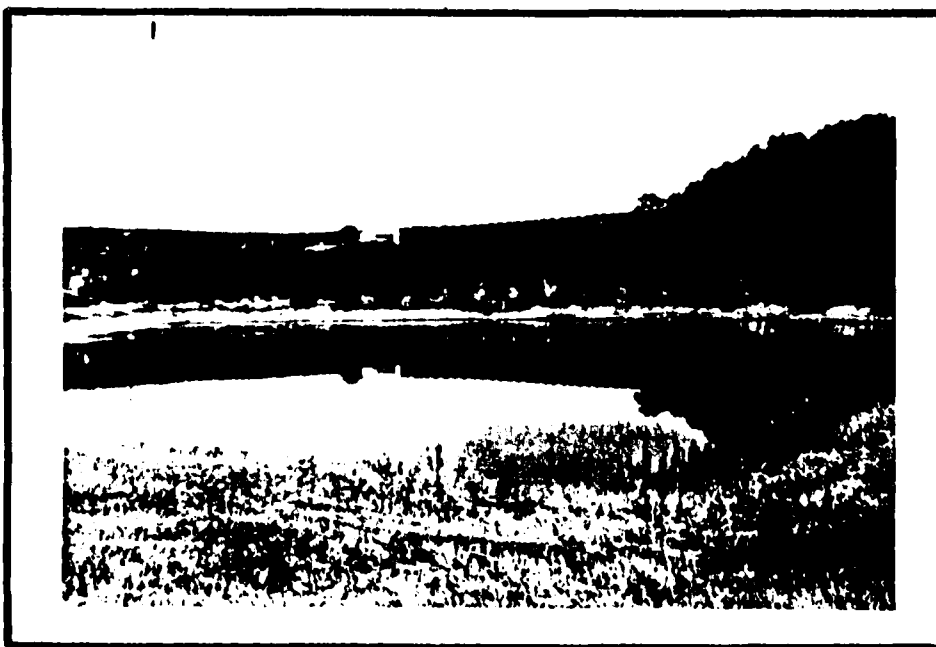


END OF OUTLET PIPE - NO. 5

PA-01099
PLATE C-111



SPILLWAY LOOKING UPSTREAM - NO. 6



RESERVOIR AND DRAINAGE AREA - NO. 7

APPENDIX D
HYDROLOGY AND HYDRAULIC CALCULATIONS

SUMMARY DESCRIPTION
OF
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION

The hydrologic and hydraulic evaluation for this inspection report has employed computer techniques using the Corps of Engineers computer program identified as the Flood Hydrograph Package (HEC-1) Dam Safety Version.

The program has been designed to enable the user to perform two basic types of hydrologic analyses: (1) the evaluation of the overtopping potential of the dam, and (2) the capability to estimate the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. A brief summary of the computation procedures typically used in the dam overtopping analysis is shown below.

- Development of an inflow hydrograph to the reservoir.
- Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.
- Routing of the outflow hydrograph(s) of the reservoir to desired downstream locations. The results provide the peak discharge and maximum stage of each routed hydrograph at the outlet of the reach.

The output data provided by this program permits the comparison of downstream conditions just prior to a breach failure with that after a breach failure and the determination as to whether or not there is a significant increase in the hazard to loss of life as a result of such a failure.

The results of the studies conducted for this report are presented in Section 5.

For detailed information regarding this program refer to the Users Manual for the Flood Hydrograph Package (HEC-1) Dam Safety Version prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California.

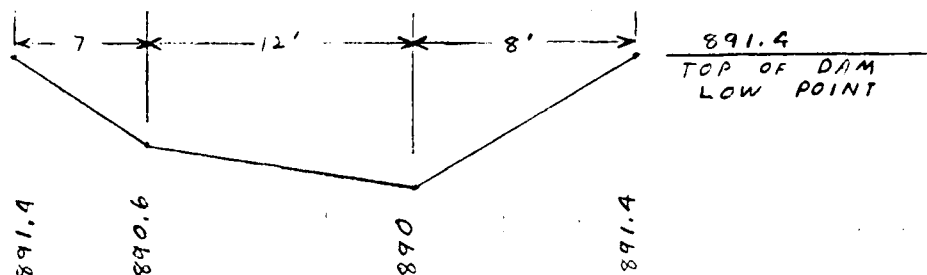
BY RLS DATE 11/14/80
CHKD. BY DATE
SUBJECT

BERGER ASSOCIATES

SHEET NO. 1 OF 9
PROJECT 00590

HIGHLAND FARM DAM

SPILLWAY RATING



EARTH SWELE
BROADCRESTED WEIR
 $C = 2.7$ (KINGS HOOK)

$$Q = CLH^{3/2}$$

$$= CL_1(H_1)^{3/2} + CL_2(H_2)^{3/2} + CL_3(H_3)^{3/2}$$

$$L_1 = 7'$$

$$H_1 = (891.4 - 890.6)/2 = .4$$

$$L_2 = 12'$$

$$H_2 = 891.4 - ((890.6 + 890)/2) = 1.1$$

$$L_3 = 8'$$

$$H_3 = (891.4 - 890)/2 = .7$$

$$Q = 2.7 \times 7 \times (.4)^{1.5} + 2.7 \times 12 \times (1.1)^{1.5} + 2.7 \times 8 \times (.7)^{1.5}$$

$$= 54.8 \text{ CFS}$$

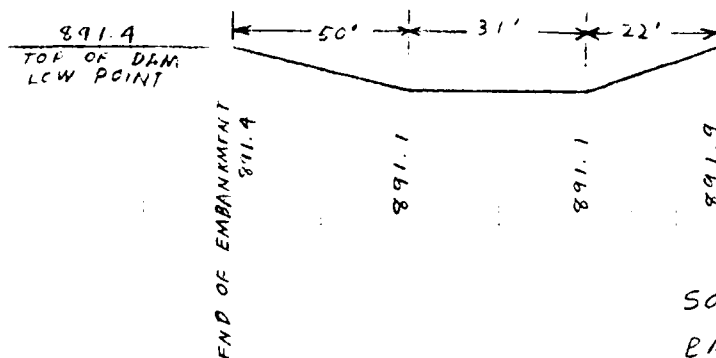
BY RLS DATE 11/19/56
CHKD. BY _____ DATE _____
SUBJECT _____

BERGER ASSOCIATES

SHEET NO. 2 OF 9
PROJECT 00590

HIGHLAND FARAI DAM

DISCHARGE THRU SWALE (RIGHT ABUTMENT)



SOD LINED SWALE
BROAD CRESTED WEIR
 $C = 2.7$ (KING'S HDBI)

$$Q = CLH^{3/2}$$

$$= CL_1(H_1)^{3/2} + CL_2(H_2)^{3/2} + CL_3(H_3)^{3/2}$$

$$L_1 = 50'$$

$$H_1 = (891.4 - 891.1) / 2 = .15$$

$$L_2 = 31'$$

$$H_2 = 891.4 - 891.1 = .3$$

$$L_3 = (.3/9) \times 22 = 7.3'$$

$$H_3 = (891.4 - 891.1) / 2 = .15$$

$$Q = 2.7 \times 50 \times (.15)^{1.5} + 2.7 \times 31 \times (.3)^{1.5} + 2.7 \times 7.3 \times (.15)^{1.5}$$

$$= 22.7 \text{ CFS}$$

BY DVK DATE 10/31/50
CHKD. BY NLS DATE 11/12/50
SUBJECT HIGHLAND PARK

BERGER ASSOCIATES

SHEET NO. 3 OF 9
PROJECT D0590

EMBANKMENT RATING

(INCLUDES SHALE AT RIGHT ABUTMENT)

$$Q = CLH^{3/2}$$

$$C = 2.7 \text{ (KINGS HDBK)}$$

AT ELEV. 891.5

$$2.7 \times 7 \times (.05)^{3/2} = -$$

$$2.7 \times 50 \times (.05)^{3/2} = 2$$

$$2.7 \times 50 \times (.25)^{3/2} = 17$$

$$2.7 \times 31 \times (.4)^{3/2} = 21$$

$$2.7 \times 11 \times (.2)^{3/2} = 3$$

$$\Sigma = 43 \text{ cfs}$$

AT ELEV. 892

$$2.7 \times 14 \times (.5)^{3/2} = 12$$

$$2.7 \times 36 \times (.25)^{3/2} = 12$$

$$2.7 \times 50 \times (.1)^{3/2} = 4$$

$$2.7 \times 50 \times (.05)^{3/2} = 2$$

$$2.7 \times 25 \times (.05)^{3/2} = 1$$

$$2.7 \times 50 \times (.3)^{3/2} = 22$$

$$2.7 \times 50 \times (.55)^{3/2} = 55$$

$$2.7 \times 50 \times (.75)^{3/2} = 88$$

$$2.7 \times 31 \times (.9)^{3/2} = 71$$

$$2.7 \times 22 \times (.5)^{3/2} = 21$$

$$2.7 \times 1.5 \times (.05)^{3/2} = -$$

$$\Sigma = 289 \text{ cfs}$$

AT ELEV. 893

$$2.7 \times 14 \times (1.5)^{3/2} = 69$$

$$2.7 \times 36 \times (1.25)^{3/2} = 136$$

$$2.7 \times 50 \times (1.1)^{3/2} = 156$$

$$2.7 \times 50 \times (1.05)^{3/2} = 145$$

$$2.7 \times 50 \times (.95)^{3/2} = 125$$

$$2.7 \times 50 \times (1.0)^{3/2} = 135$$

$$2.7 \times 50 \times (1.3)^{3/2} = 250$$

$$2.7 \times 50 \times (1.55)^{3/2} = 261$$

$$2.7 \times 50 \times (1.75)^{3/2} = 313$$

$$2.7 \times 31 \times (1.9)^{3/2} = 219$$

$$2.7 \times 22 \times (1.5)^{3/2} = 109$$

$$2.7 \times 17 \times (.55)^{3/2} = 19$$

$$\Sigma = 1887 \text{ cfs}$$

$$\text{AT 894 } \Sigma = 4907 \text{ cfs}$$

BY RLS DATE 11/18/80

BERGER ASSOCIATES

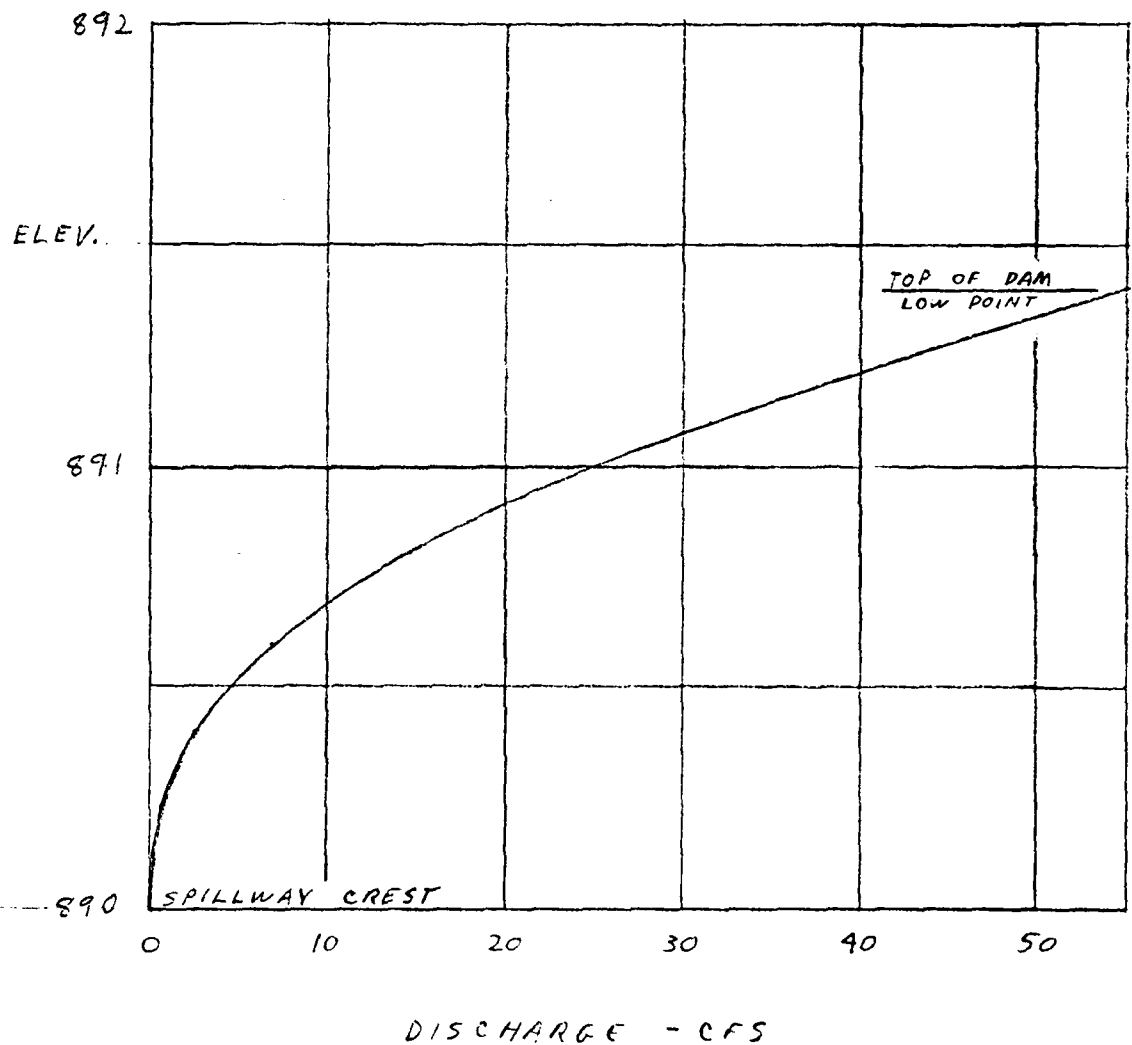
SHEET NO. 4 OF 9

CHKD. BY _____ DATE _____

PROJECT DO 590

SUBJECT HIGHLAND FARM DAM

SPILLWAY RATING CURVE



BY RLS DATE 11/13/80

BERGER ASSOCIATES

SHEET NO. 5 OF 9

CHKD. BY _____ DATE _____

PROJECT 005909

SUBJECT _____

HIGHLAND FARM DAM

DISCHARGE THROUGH OUTLET WORKS

6" DIA. CAST IRON PIPE

N = .015 (KINGS HORN)

LENGTH = 200' ±

OUTLET ELEVATION = 861.5

$$Q = 1.486 \frac{A}{N} R^{2/3} S^{1/2}$$

AT POOL LEVEL 890

$$S = (890 - 861.5) / 200 = .1425$$

$$Q = 1.486 \times \left(\pi \times \left(\frac{.5}{4} \right)^2 \right) \times \left(\frac{.5}{4} \right)^{2/3} \times (.1425)^{1/2} / .015$$

$$= 1.8 \text{ CFS}$$

AT LOW POOL LEVEL 870

$$S = (870 - 861.5) / 200 = .0425$$

$$Q = 1.486 \times \left(\pi \times \left(\frac{.5}{4} \right)^2 \right) \times \left(\frac{.5}{4} \right)^{2/3} \times (.0425)^{1/2} / .015$$

$$= 1.0 \text{ CFS}$$

BY RLS DATE 11/19/80
CHKD. BY _____ DATE _____
SUBJECT _____

BERGER ASSOCIATES

SHEET NO. 6 OF 9
PROJECT 00590

HIGHLAND FARM DAM

MAXIMUM KNOWN FLOOD AT DAMSITE

THERE ARE NO RECORDS OF POOL LEVELS FOR THIS DAM. BASED ON THE RECORDS OF THE GAGING STATION FOR CONOCOCHEAQUE CREEK AT NEARBY FAYETTEVILLE, PA. (D.A. = 5.05 SQ. MI.) THE MAXIMUM DISCHARGE AT THE GAGE OCCURRED IN JUNE 1972 WHEN A DISCHARGE OF 392 CFS WAS OBSERVED. THE MAXIMUM INFLOW TO HIGHLAND FARM POND IS ESTIMATED TO BE:

$$Q = \left(\frac{.24}{5.05} \right)^{0.8} \times 392$$
$$= 34 \text{ CFS}$$

DESIGN FLOOD

SIZE CLASSIFICATION

MAXIMUM STORAGE = 48 ACRE-FEET

MAXIMUM HEIGHT = 26 FEET

SIZE CLASSIFICATION IS "SMALL"

HAZARD CLASSIFICATION

A STATE HIGHWAY CROSSES THE STREAM CHANNEL A SHORT DISTANCE DOWNSTREAM.

USE "SIGNIFICANT"

RECOMMENDED SPILLWAY DESIGN FLOOD

THE ABOVE CLASSIFICATIONS INDICATE USE OF AN SDF EQUAL TO THE 100 YR FLOOD TO ONE-HALF THE PROBABLE MAXIMUM FLOOD.

BY RLS DATE 12/18/80
CHKD. BY _____ DATE _____
SUBJECT _____

BERGER ASSOCIATES

SHEET NO. 7 OF 9
PROJECT D0590

HIGHLAND FARM DAM

100 YR FLOOD

REF: "HYDROLOGIC STUDY, TROPICAL STORM AGNES"
NORTH ATLANTIC DIVISION, U.S. ARMY, CORPS OF ENGINEERS.

DRAINAGE AREA = .24 SQ. MI.

(FIG. 21) $C_m = 1.95$

$$\begin{aligned}\log(Q_m) &= C_m + .75 \log(DA) \\ &= 1.95 + .75 \log(.24) = 1.485\end{aligned}$$

(FIG. 22) $C_s = .35$

$$\begin{aligned}S &= C_s - 0.05 \log(DA) \\ &= .35 - 0.05 \log(.24) = .381\end{aligned}$$

(FIG. 23) $SKEW = .45$

STANDARD DEVIATE = $K(P, g) = 2.6506$

$$\log(Q(P)) = \log(Q_m) + K(P, g) S$$

$$\begin{aligned}\log(Q_1) &= 1.485 + (2.6506 \times .381) \\ &= 2.495\end{aligned}$$

$$Q_1 = 313 \text{ CFS}$$

BY RLS DATE 12-18/80
CHKD. BY _____ DATE _____
SUBJECT _____

BERGER ASSOCIATES

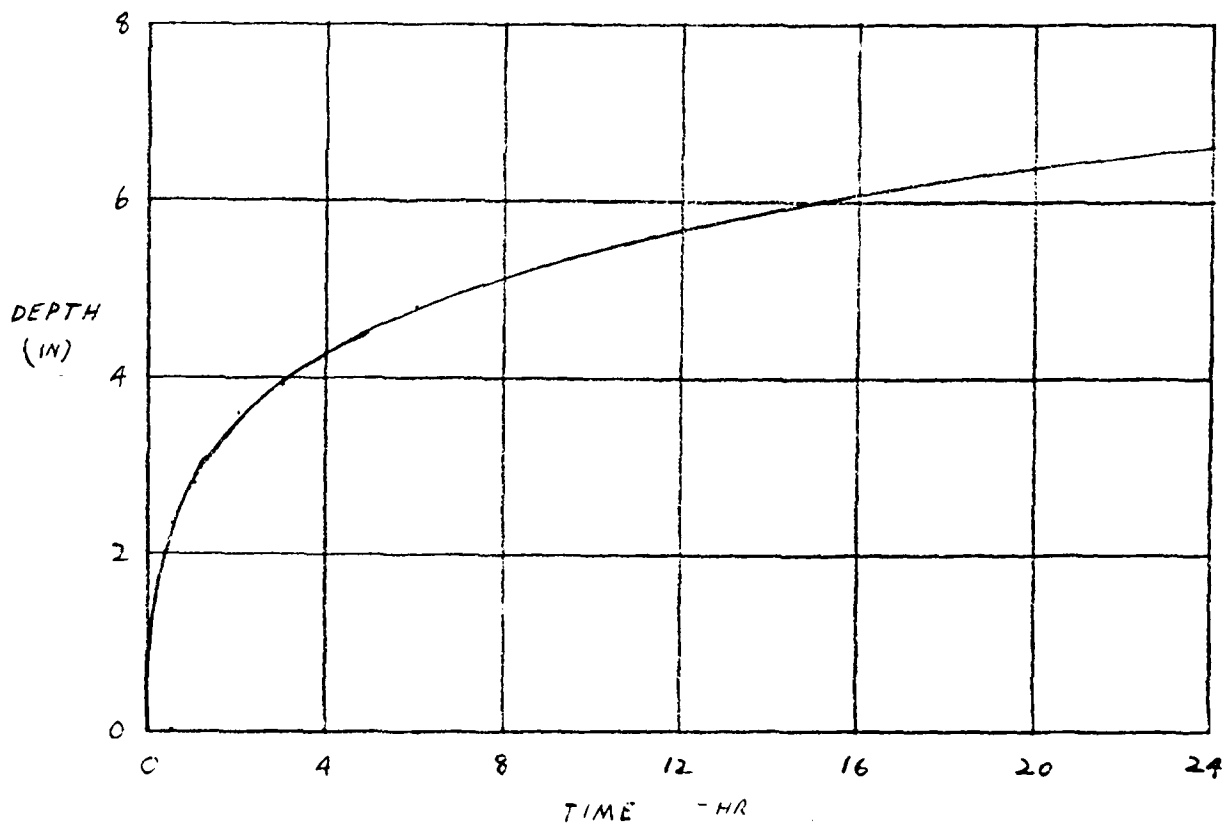
SHEET NO. 8 OF 9
PROJECT D0590

HIGHLAND FARM DAM

100 YR FLOOD (CONT.)

TOTAL RAINFALL (FROM TP-40)

DURATION (HR)	DEPTH (IN)
.5	2.35
1	2.89
2	3.60
3	3.92
6	4.79
12	5.66
24	6.62



$$Q_{100} = 313 \text{ CFS}$$

BY: RLS
CHKD. BY
SUBJECT

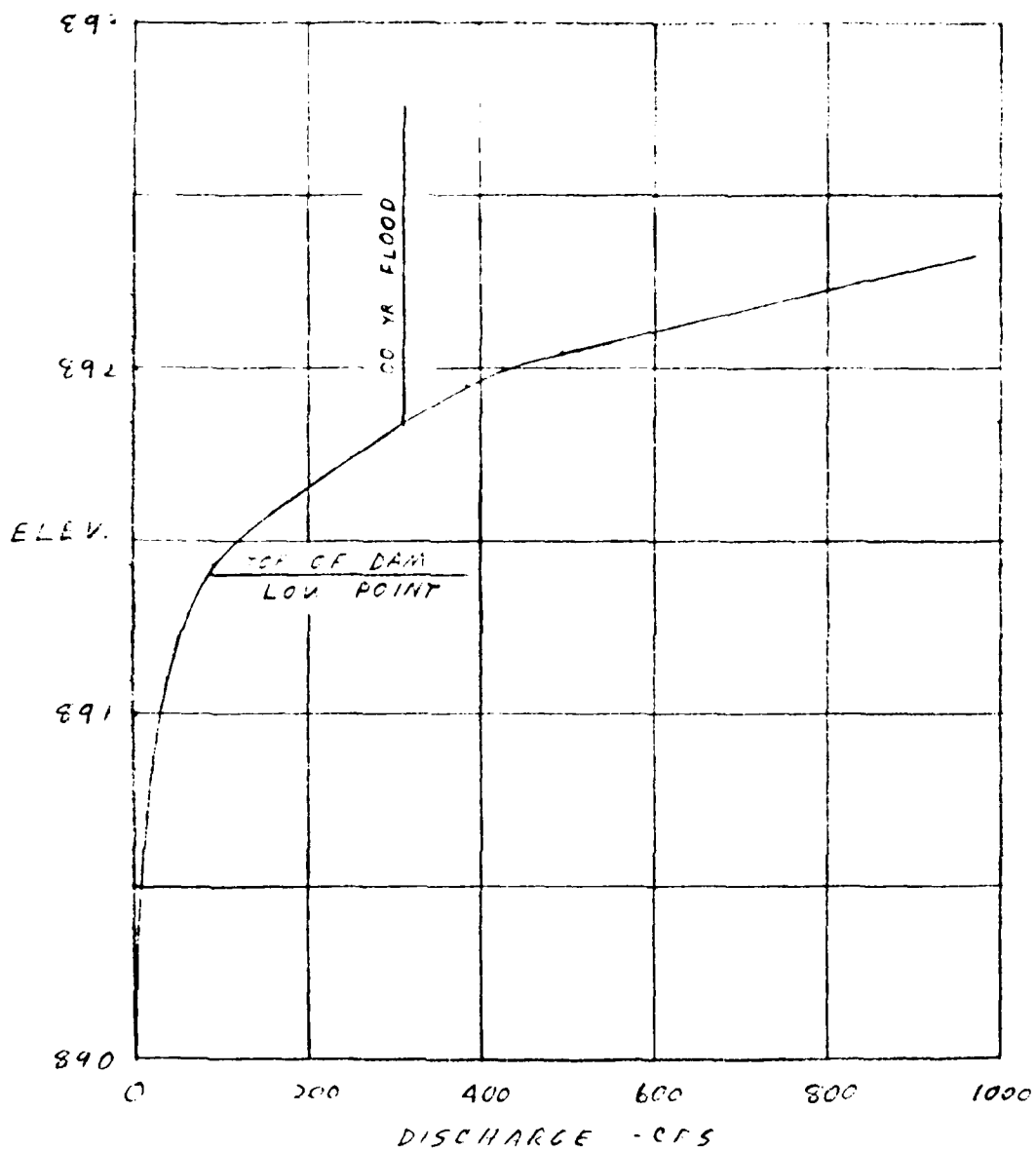
DATE 2/4/51
DATE

BERGER ASSOCIATES

HIGHLAND FARM DAM

SHEET NO. 9 OF 9
PROJECT 10590

SPILLWAY CAPACITY CURVE



HYDROLOGY AND HYDRAULIC ANALYSIS DATA BASE

NAME OF DAM: Highlands Farm Dam RIVER BASIN: Susquehanna
 PROBABLE MAXIMUM PRECIPITATION (PMP) = 23.5 INCHES/24 HOURS ⁽¹⁾

(FOR FOOTNOTES SEE NEXT PAGE)

STATION		1	2	3	4
STATION DESCRIPTION		Highlands Farm Dam	Highlands Farm Pond Dam		
DRAINAGE AREA (SQUARE MILES)		.24			
CUMULATIVE DRAINAGE AREA (SQUARE MILE)		.24	.24		
ADJUSTMENT OF PMP FOR DRAINAGE AREA (%) ⁽²⁾ 6 HOURS 12 HOURS 24 HOURS 48 HOURS 72 HOURS					
SNYDER HYDROGRAPH PARAMETERS ZONE ⁽³⁾ C_p / C_1 ⁽⁴⁾ L (MILES) ⁽⁵⁾ L _{co} (MILES) ⁽⁵⁾ $T_p = C_1 (L \cdot L_{co})^{0.3}$ (Hours)		15A .54/1.15 .83 .3 .76			
SPILLWAY DATA CREST LENGTH (FT.) FREEBOARD (FT.) DISCHARGE COEFFICIENT EXPONENT ELEVATION			27 1.4 2.7 1.5 890		
AREA ⁽⁶⁾ (ACRES) NORMAL POOL 890 ELEV. <u>910</u> ELEV. _____		5.1 10.1			
STORAGE (ACRE - FEET) NORMAL POOL ⁽⁷⁾ ELEV. <u>866</u> ⁽⁸⁾ ELEV. _____ ⁽⁸⁾ ELEV. _____ ⁽⁸⁾		41 0			

- (1) Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.
- (2) Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.
- (3) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficient: (C_p and C_t).
- (4) Snyder's Coefficients.
- (5) L = Length of longest water course from outlet to basin divide.
 L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.
- (6) Planimetered area encompassed by contour upstream of dam.
- (7) PennDER files.
- (8) Computed by conic method.

LAST MODIFICATION 26 FEB 79

1	A1	HIGHLAND FARM POND DAM	****	UNNAMED TRIB. TO LATIMORE CREEK						
2	A2	LATIMORE TWP., ADAMS COUNTY, PA.								
3	A3	MDI # PA-01099	PA DER # 1-27							
4	B	300	0	15	0	0	0	0	0	-4
5	B1	5								
6	J	1	1	1						
7	J1	1								
8	K		1					1		
9	K1									
10	M		1	.24						
11	O	96								
12	O1	.01	.02	.02	.02	.02	.02	.02	.02	.02
13	O1	.02	.02	.02	.02	.02	.02	.02	.02	.02
14	O1	.02	.02	.02	.03	.03	.03	.03	.03	.03
15	O1	.03	.04	.04	.04	.05	.05	.06	.06	.07
16	O1	.08	.09	.10	.11	.16	.19	.28	.52	1.83
17	O1	.19	.14	.10	.10	.09	.08	.07	.07	.06
18	O1	.05	.05	.04	.04	.04	.03	.03	.03	.03
19	O1	.03	.03	.02	.02	.02	.02	.02	.02	.02
20	O1	.02	.02	.02	.02	.02	.02	.02	.02	.02
21	O1	.02	.02	.02	.02	.01	.01			
22	I							.2	.02	
23	W	.76	.54							
24	X	-1.5	-1.05	2						
25	Y	1	2					1		
26	K1									
27	Y									
28	Y1	1						41	-1	
29	Y4	890.4	890.8	891.5	891	891.4	891.5	892	893	894
30	Y	3	7	15	25	78	108	411	2159	4865
31	Y4	890.4	891	891.5						
32	Y8	890.8	891	891.5						
33	Y5	891								
34	Y7	891.4								
35	Y1	891								

1 REVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	1
ROUTE HYDROGRAPH TO	2
END OF NETWORK	

HIGHLAND FARM POND DAM **** UNNAMED TRIB. TO LATIMORE CREEK
 LATIMORE TWP., ADAMS COUNTY, PA.
 MDI # PA-01099 PA DER # 1-27

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	15	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAKE	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	.24	0.00	.24	0.00	0.000	0	0	0

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTICK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	.20	.02	0.00	0.00

UNIT HYDROGRAPH DATA

TP= .76 CP= .54 NTA= 0

RECESSION DATA

STRTO= -1.50 GRCSN= -.05 RTICR= 2.00

UNIT HYDROGRAPH 21 END-OF-PERIOD COORDINATES, LAG= .76 HOURS, CP= .54 VOL= 1.00

17.	59.	. 99.	106.	85.	64.	48.	36.	27.	20.
15.	11.	8.	6.	5.	4.	3.	2.	1.	1.
1.									

0										END-OF-PERIOD FLOW									
MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q						

SUM 6.62 5.99 .63 3782.
(188.)(152.)(16.)(107.09)

HYDROGRAPH ROUTING

RESERVOIR ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

3

ROUTING DATA									
	CLOSS	CLOSS	AVG	IRIS	ISAME	IOPT	IPMP	LSTR	
	0.0	0.000	0.00	1	0	0	0	0	
		WSTPS	WSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
		1	0	0	0.000	0.000	0.000	41.	-1
STAGE	890.00	890.40	890.60	890.80	891.00	891.40	891.50	892.00	893.00 894.00
FLOW	0.00	3.00	7.00	15.00	25.00	78.00	108.00	411.00	2159.00 4865.00
SURFACE AREA=	0.	5.	10.						
CAPACITY=	0.	41.	190.						
ELEVATION=	866.	890.	910.						
	CREL	SPWID	COOW	EXPW	ELEVL	COGL	CAREA	EXPL	
	890.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

DAM DATA			
TOPEL	COGD	EXPD	DAMWID
891.4	0.0	0.0	0.

PEAK OUTFLOW IS 311. AT TIME 13.00 HOURS

1 ***** **** ***** ***** *****

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS				
OPERATION	STATION	AREA	PLAN	RATIO 1
				1.00
HYDROGRAPH AT	1	.24	1	313.
	(.62)	(8.65)(
ROUTED TO	2	.24	1	311.
	(.62)	(8.62)(

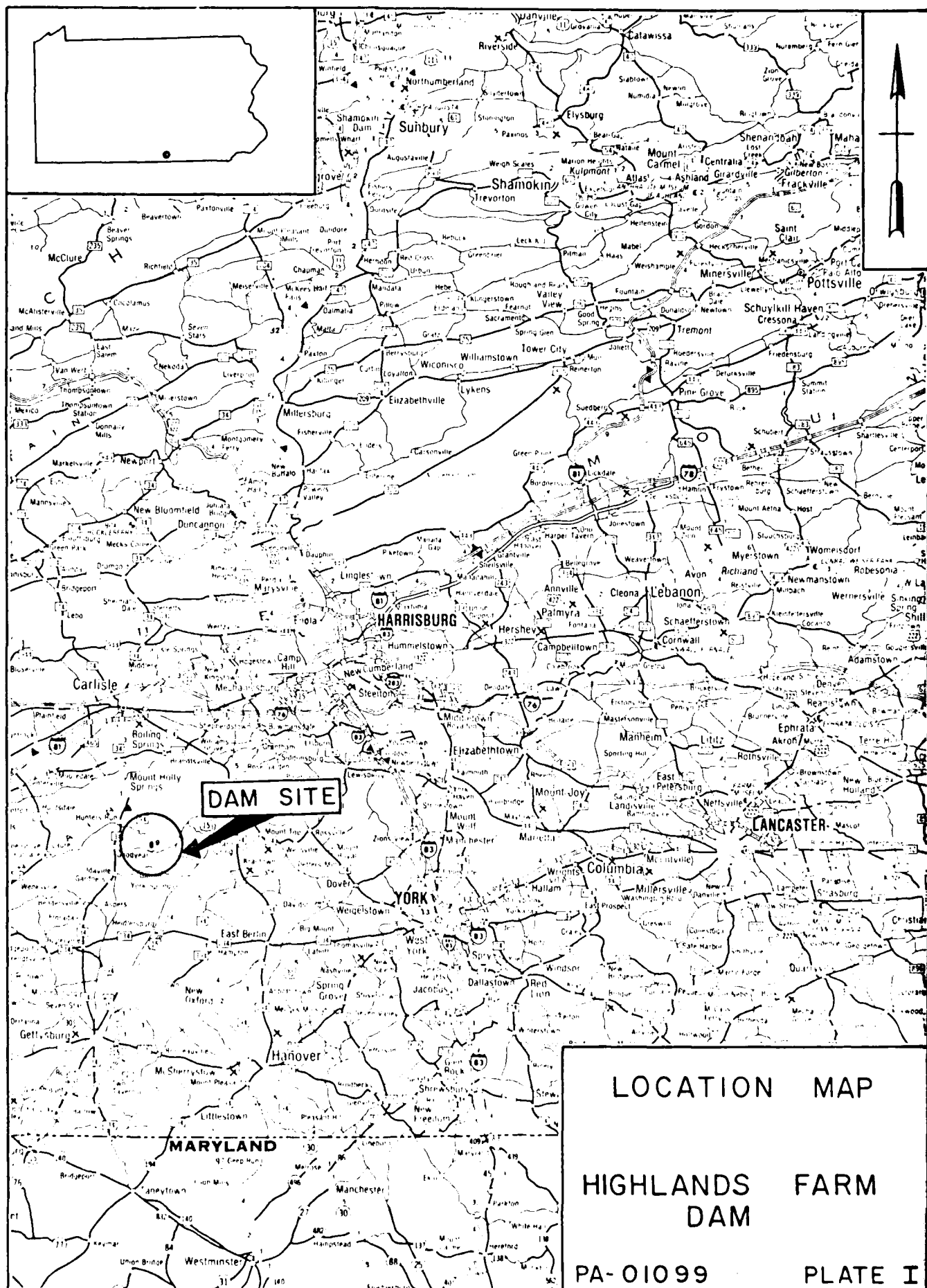
1 - SUMMARY OF DAM SAFETY ANALYSIS

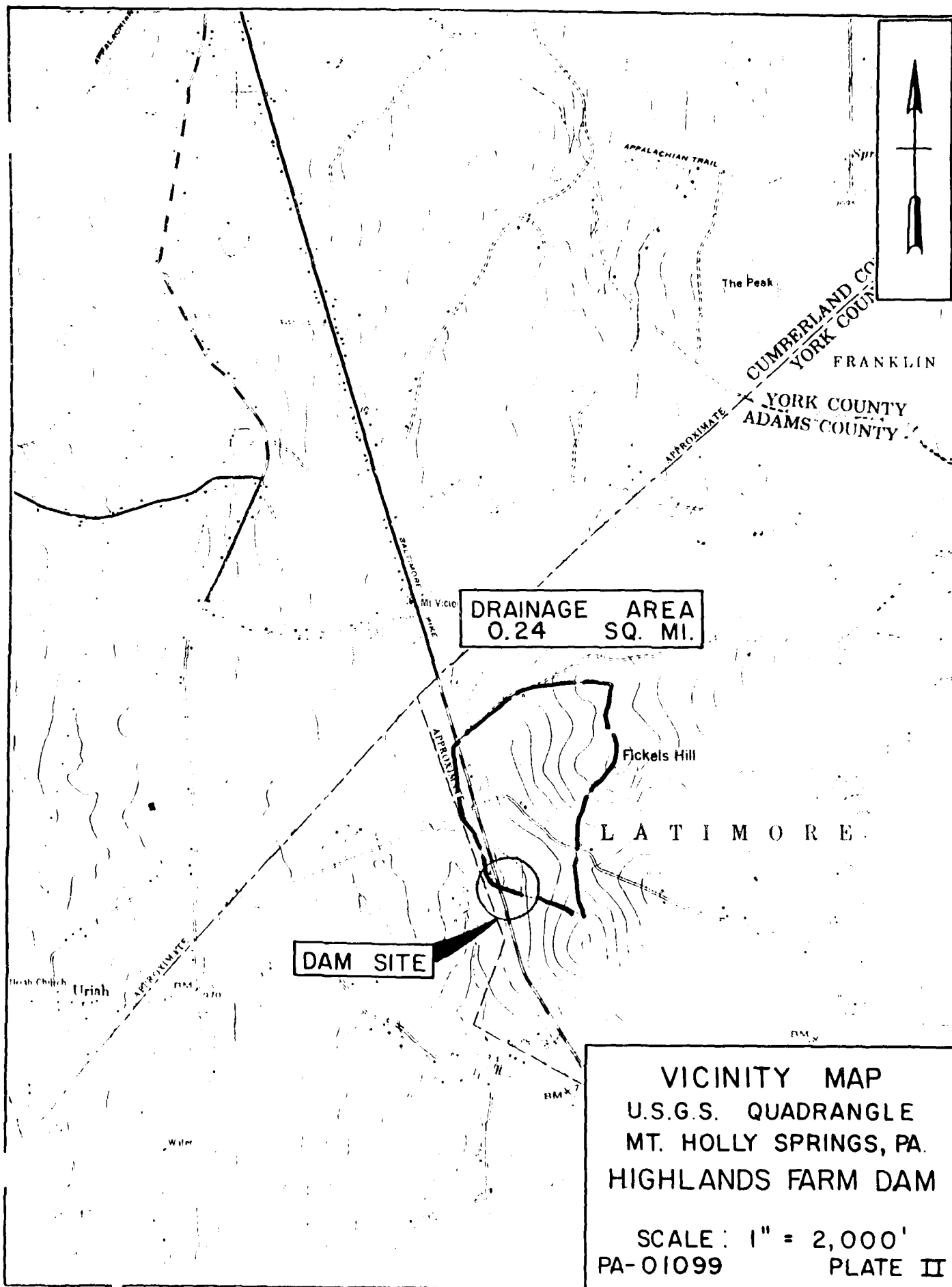
PLAN 1		INITIAL VALUE		SPILLWAY CREST		TOP OF DAM	
	ELEVATION	890.03		890.00		891.40	
	STORAGE	41.		41.		43.	
	OUTFLOW	0.		0.		78.	
RATIO OF INF SDF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	891.64	.44	51.	311.	3.00	13.00	0.00

FOR FURTHER INFO.

APPENDIX E

PLATES





DRAINAGE AREA
0.24 SQ. MI.

DAM SITE

VICINITY MAP
U.S.G.S. QUADRANGLE
MT. HOLLY SPRINGS, PA.
HIGHLANDS FARM DAM
SCALE: 1" = 2,000'
PA-01099 PLATE II

APPENDIX F
GEOLOGIC REPORT

APPENDIX F

GEOLOGIC REPORT

BEDROCK - DAM AND RESERVOIR

This area overlies a metabasalt, which is an altered basalt lava composed of fine grained, pale to olive-green quartz epidote rock with numerous pyrite cubes. Weathering of this rock results in an oxidized surface.

STRUCTURE

The dam and reservoir lie on what is known as the stone head anticline. Jointing is moderately developed, closely spaced and in a platy to irregular pattern. Open joints are characteristic, although some are quartz filled. The dip ranges from 45-85°.

OVERBURDEN

The overburden in this area most probably consists of a residual soil.

AQUIFER CHARACTERISTICS

The secondary porosity of this formation is of low magnitude and it has an apparent porosity of 0.48-0.70%. Subsurface seepage within the formation should be of little concern.

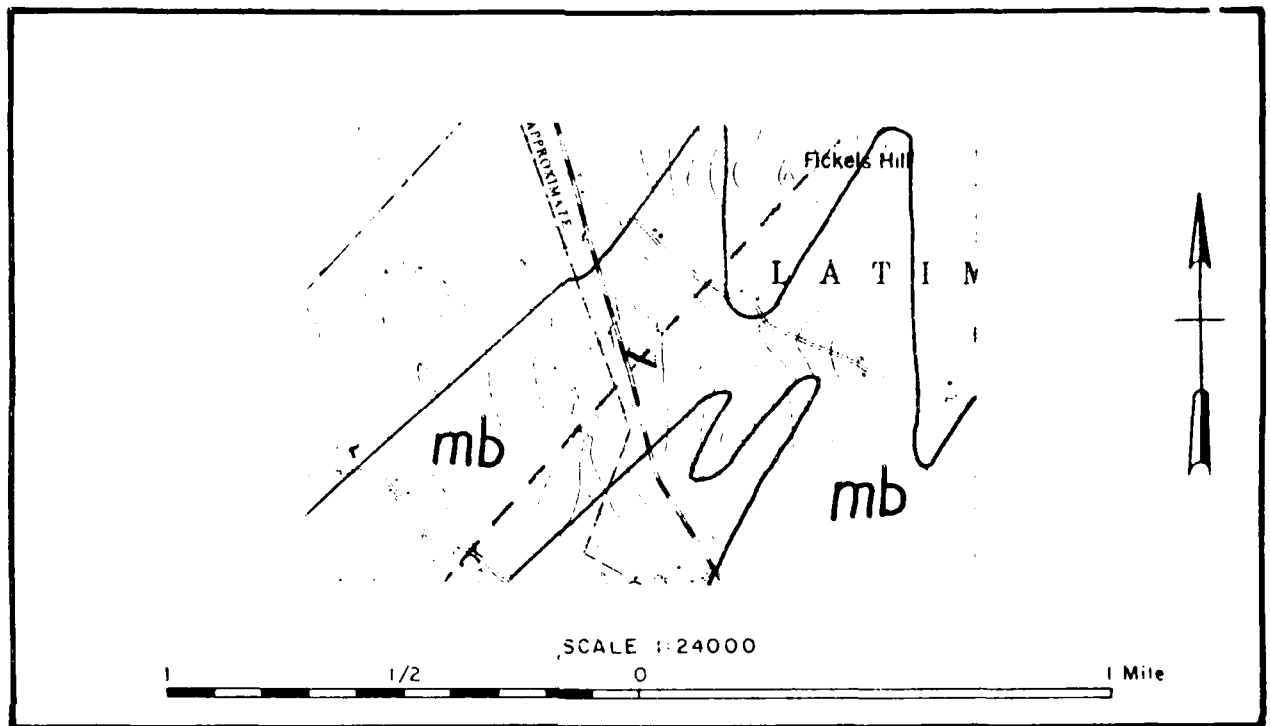
DISCUSSION

There are no available construction plans for this dam. However, the metabasalts provide an excellent foundation for heavy structures.

SOURCES OF INFORMATION

1. Freedman, J., 1967. Geology of a Portion of the Mt. Holly Springs Quadrangle, Adams and Cumberland Counties, Pennsylvania: Pennsylvania Geological Survey PR 169.
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GEOLOGIC MAP - HIGHLANDS FARM DAM



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